Update on Branched Broomrape Biology, Management, and Host Studies

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UCCE S. Sac. Tomato Mtg
Woodland, CA
1/13/26

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Broomrape in California

- Obligate parasitic plants that attach to host roots

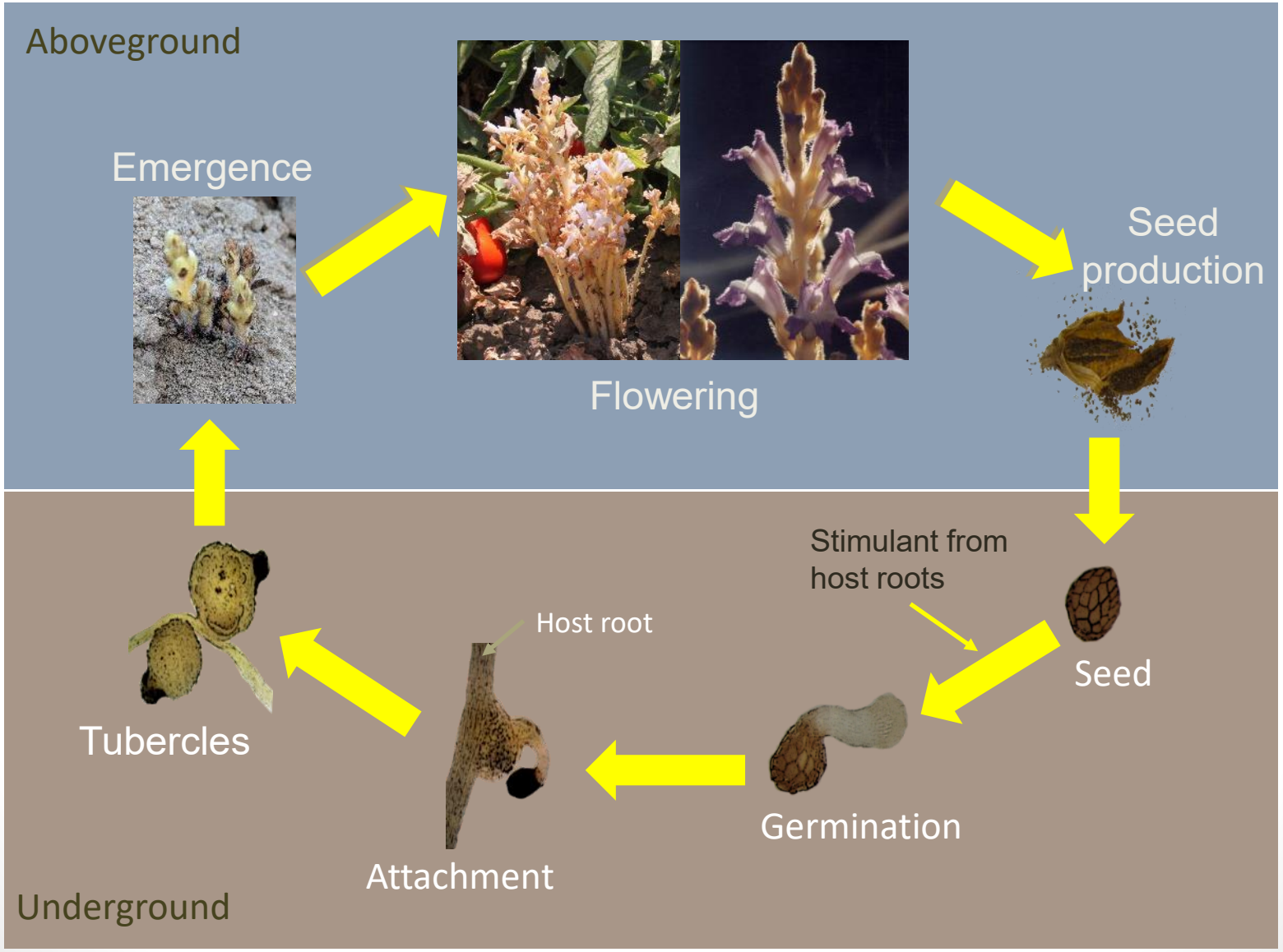
- At least two species have been detected in CA tomato fields
  - Branched broomrape (*Orobanche ramosa*) - "A-listed"
  - Egyptian broomrape (*Orobanche aegyptiaca*) – "Q-listed"
- Branched broomrape has been reported on-and-off for decades
- Egyptian broomrape has a wider host range (~23 crops grown in CA!) and may be an even more serious risk
  - First report in North America – Solano Co. in 2014, 2017 (and in 2025)

Interesting sidenote: *Orobanche cumana* reported in Washington in August 2025. First in North America.

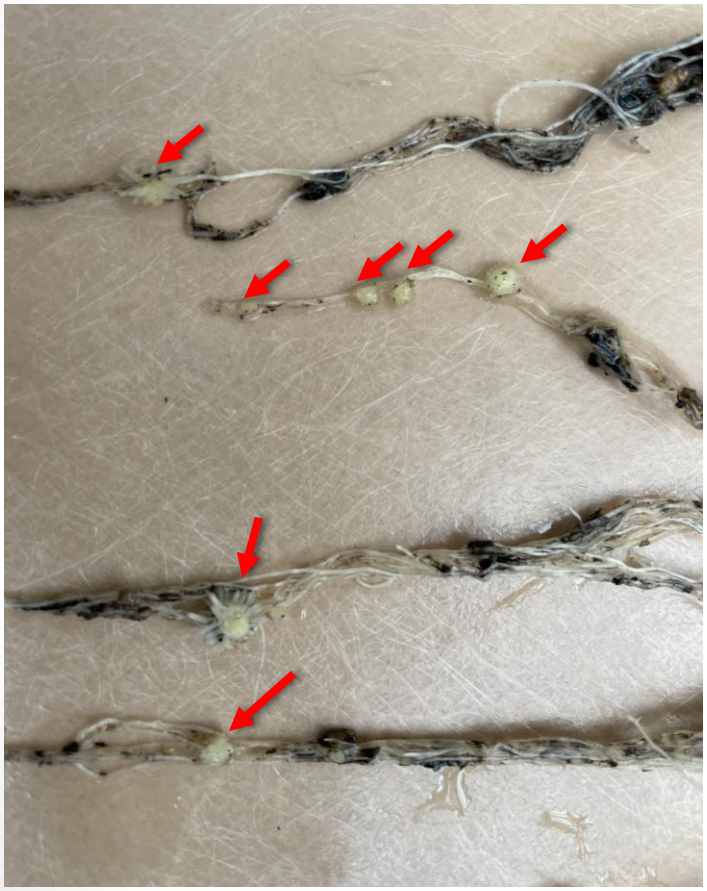
Branched broomrape in tomato

Broomrape at high density in Chile

Lifecycle

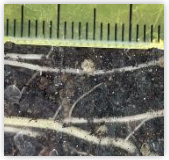

Aboveground
Emergence
Flowering
Seed production
Stimulant from host roots
Seed
Host root
Tubercles
Germination
Attachment
Underground

Monitoring broomrape life cycle



Aboveground

Underground



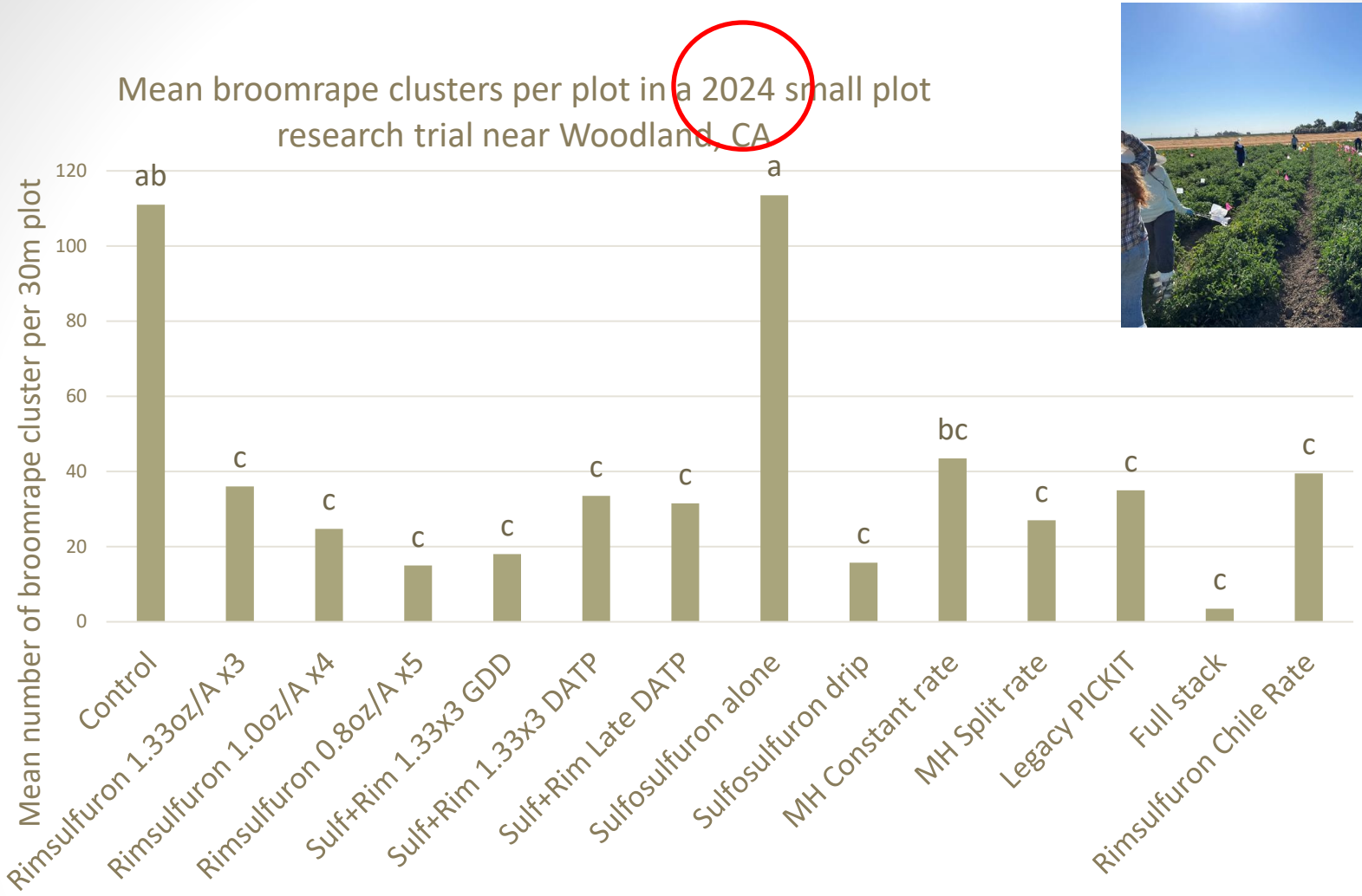
- Since ~ 2020, about half my program's effort has been focused on broomrape in processing tomato
- Currently, staff focused on:
  - Vulchi/Fatino – project lead for field chemigation and variety testing
  - Hossieni – project lead for lab, greenhouse, CRF projects; especially QAC sanitizer evaluations and biology/modeling work
  - Bhusal – chemical management with foliar products

Research foci

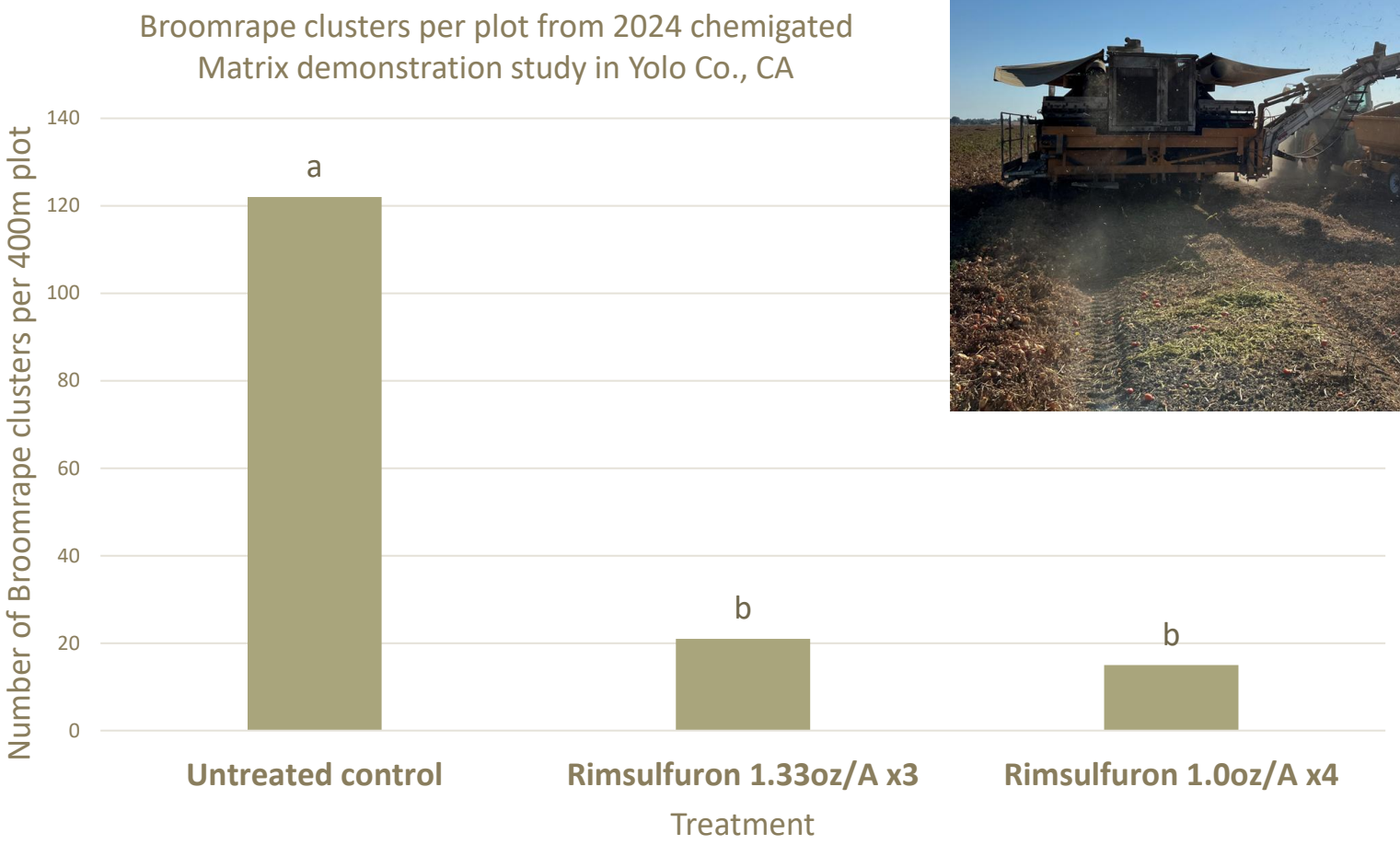
- Field:
  - Herbicide, chemigation and PGR testing
  - Tomato variety screening (field and GH), also grafted varieties
  - Tomato planting date trials
  - One fumigation trial (failed in 2021, planning reboot in 2026)
- Greenhouse and CRF
  - Tomato cultivars, alternate hosts,
  - Biology, phenology, GDD
  - Germination stimulants
- Lab
  - Sanitizer efficacy on seed
    - (closely coordinated with Swett lab “Team Clean Machine” and CTRI)
  - Germination stimulants
  - Flooding, fertilizer impacts

Overview of recent broomrape management trials

- 2023/24/25 continued to evaluate chemigated rimsulfuron (24c SLN) alone and paired with PPI sulfosulfuron
  - Foliar applications of maleic hydrazide
  - Variety screening and field trials
  - Planting date trials



- In most of our small plot research, rimsulfuron chemigation at US rates reduces broomrape emergence by ~70-86%
- However, in 2025 all treatments except MH performed poorly (not shown)
  - Need to understand what happened in the 2025 chemigation treatments
- MH was extremely effective in the 2025 “stacked” treatment
  - Working with manufacturer and IR4 to pursue MH further.



- Larger-scale demo of Matrix protocol ~85% broomrape reduction
- No yield impact of herbicide program vs non-chemigated control

Fatino and Hanson

Efficacy of different treatments using foliar maleic hydrazide on broomrape emergence, Woodland, CA, 2025.

No.	Treatment	Cumulative broomrape counts per plot[i]	
		Trial 1	Trial 2
1	Untreated control	41.25 a[ii]	0.25 a
2	Matrix® (1.33 oz/A ×3)	33.25 a	0 a
3	Sprout-Stop® (28 fl oz/A ×6)	0.5 b	0 a
4	Sprout-Stop® (21 fl oz/A ×2 + 28 fl oz/A ×4)	0.25 b	0 a
5	Sprout-Stop® (32 fl oz/A ×6)	0.5 b	0 a
6	Sprout-Stop® (28 fl oz/A ×2 + 32 fl oz/A ×4)	0 b	0 a
7	Sprout-Stop® (28 fl oz/A ×8)	0 b	0 a
8	Outrider® (1.75 oz/A, PPI) + Matrix® (1.33 oz/A ×3) + Sprout-Stop® (32 fl oz/A ×6)	0.25 b	0 a
P value		0.0003	0.459

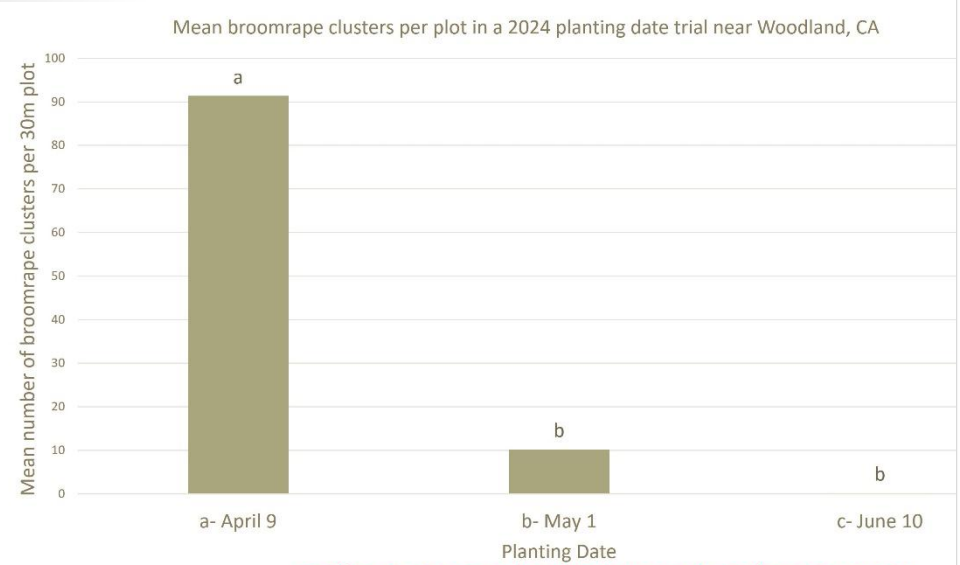
Trial 1 transplanted April 9, Trial 2 planted May 13

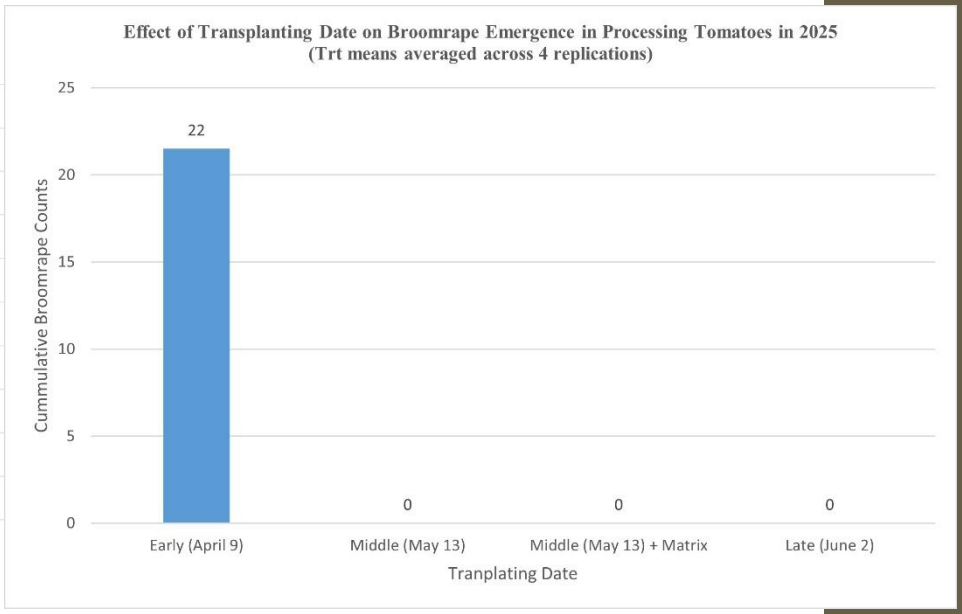
Bhusal and Hanson

Tomato variety screening

- Field
  - Thus far, no clear differences among commercial cultivars in larger scale demo or replicated plots
  - Have tested some research materials (cultivars and/or grafted); thus far, data have mostly been negative or inconclusive due to planting date challenges
- Greenhouse
  - Two GH runs of top ~20 PTAB varieties
    - Minimal differences in total parasitism
  - Have some small studies with research materials ongoing in GH

2024 and 2025 planting date trials





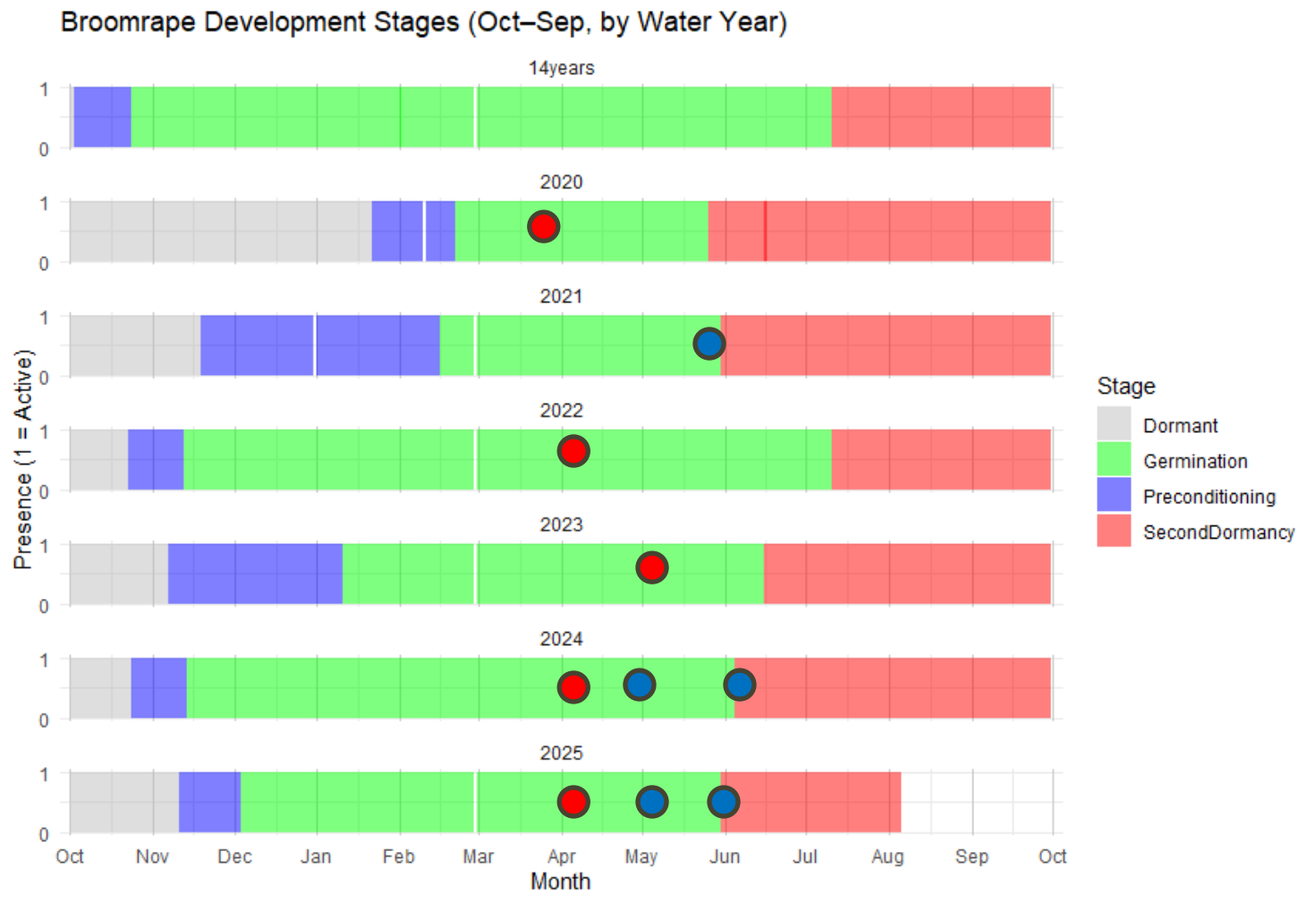
- California planting date trial supportive of previous trial conducted in Chile; planting at-risk fields as late as feasible within the planting cycle may be of potential benefit

Fatino, Vulchi, Bhusal, and Hanson

2024 planting date trial

Explaining and predicting

more broomrape
less broomrape

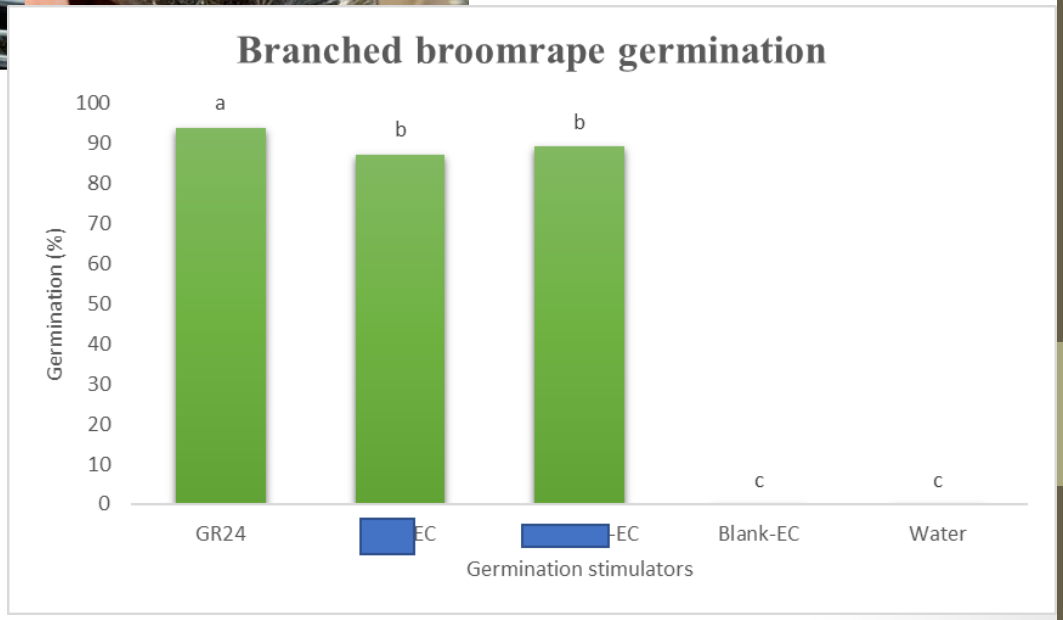


Hosseini, Mesgaran, Hanson (analyses in process)

Germination stimulation studies

- Tested in field in 2025
  - Inconclusive results due to planting date
  - Will regroup in 2026
- New GH and lab work underway

Collaborations with Striga researchers in Saudi Arabia (KAUST)



CA non-tomato host screening

- Small-scale in broomrape greenhouse
  - So far, 34 crops from 11 families evaluated
  - Double-cup system (1 Liter pots) and potting media with ~50 broomrape seed at planting/transplanting
  - Data are categorical (high/med/low/non) based on number of replicate pots with attachments or emergence observed
- Gaol: ID “hosts”, “non-hosts”, “false hosts”

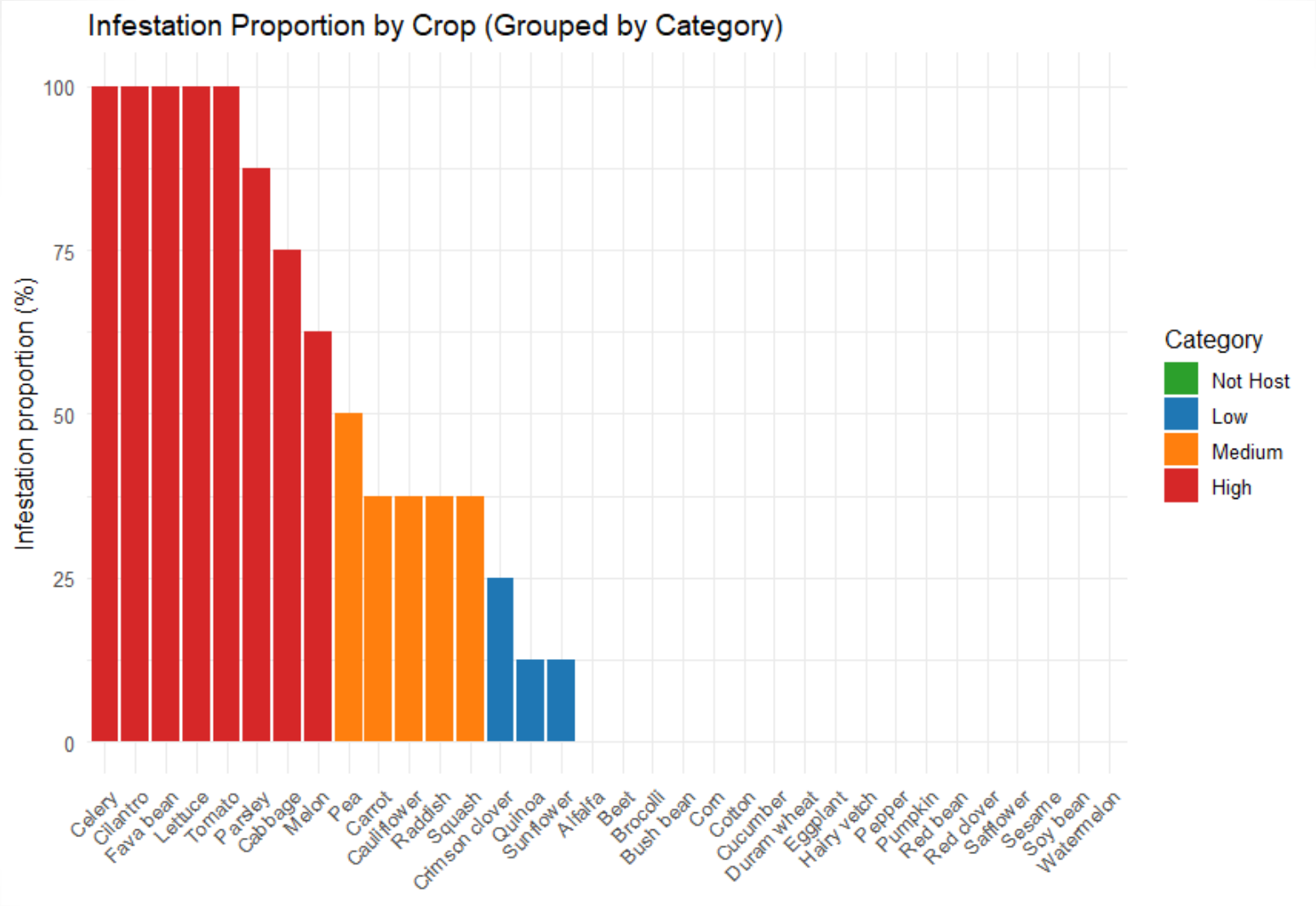


Figure 1. Infestation outcomes of 34 crops in host screening (8 replicates per crop). Number of crops classified based on infestation proportion: *Not Host* (0%), *Low* (1–25%), *Medium* (26–50%), and *High* (>50%).

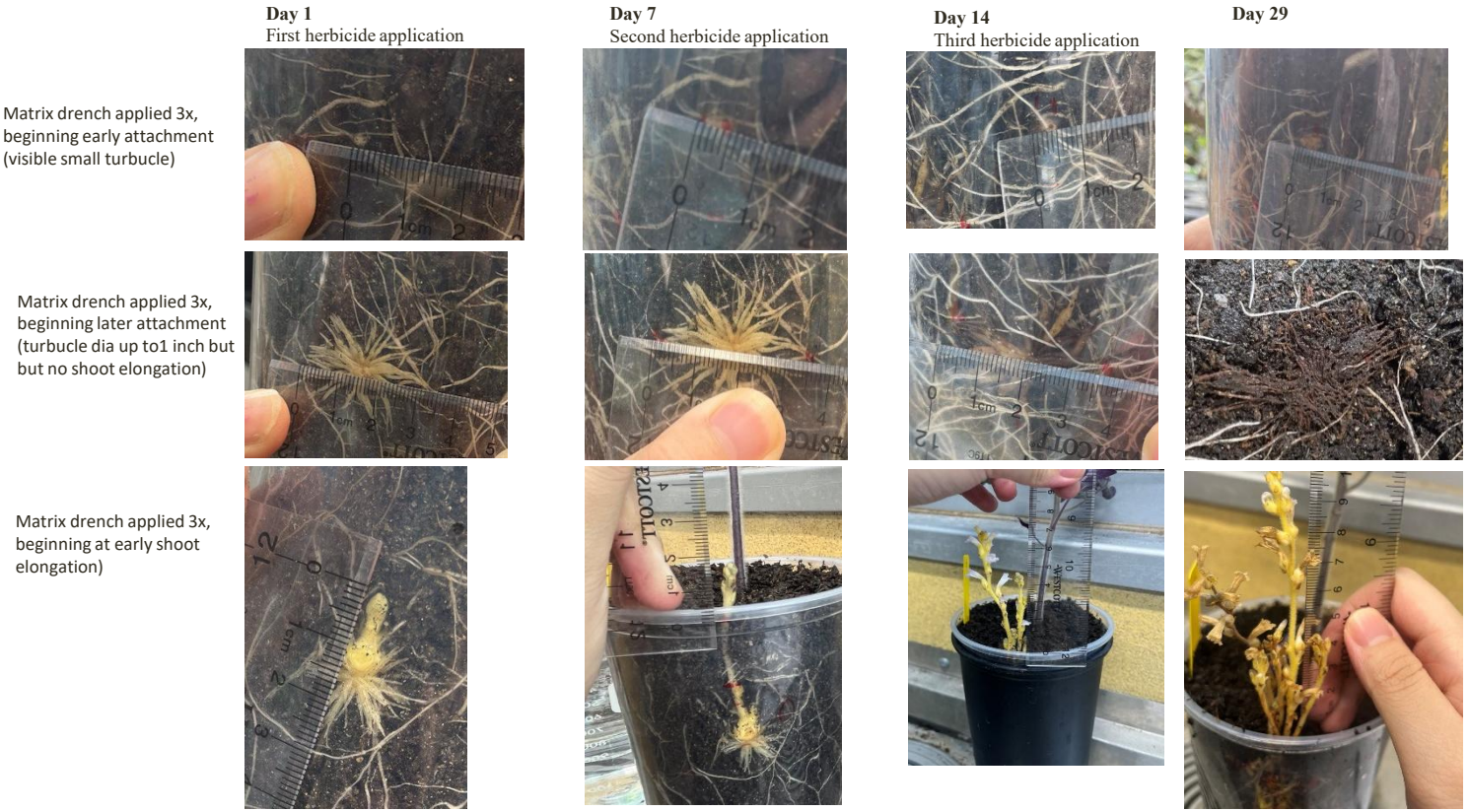
Hosseini, Tang, and Hanson

Chemigation discussion

- The Matrix chemigation protocol
  - Three applications via buried drip irrigation
    - (Note: spraying Matrix was not effective for broomrape management)
  - Each application 1.33 oz product per acre. = 4oz product per acre per yr
- The 24c label indicates 30, 50, and 70 days after transplant.
  - My current rec is to start earlier, more like 20, 30, and 40 DATP
  - However, it will be better to base on GDD models

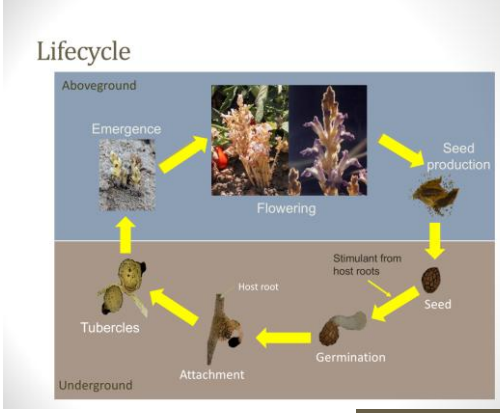
- Why? What are we trying to achieve? Balance:
  - starting early enough to control early broomrape
  - Spacing the treatments to accommodate relatively short half life
  - Get treatment efficacy for long enough to control late broomrape (but not longer than necessary after germination stops)
  - The phenological stages depend on temp, not days. This is a challenge for using DATP models in a crop like tomato

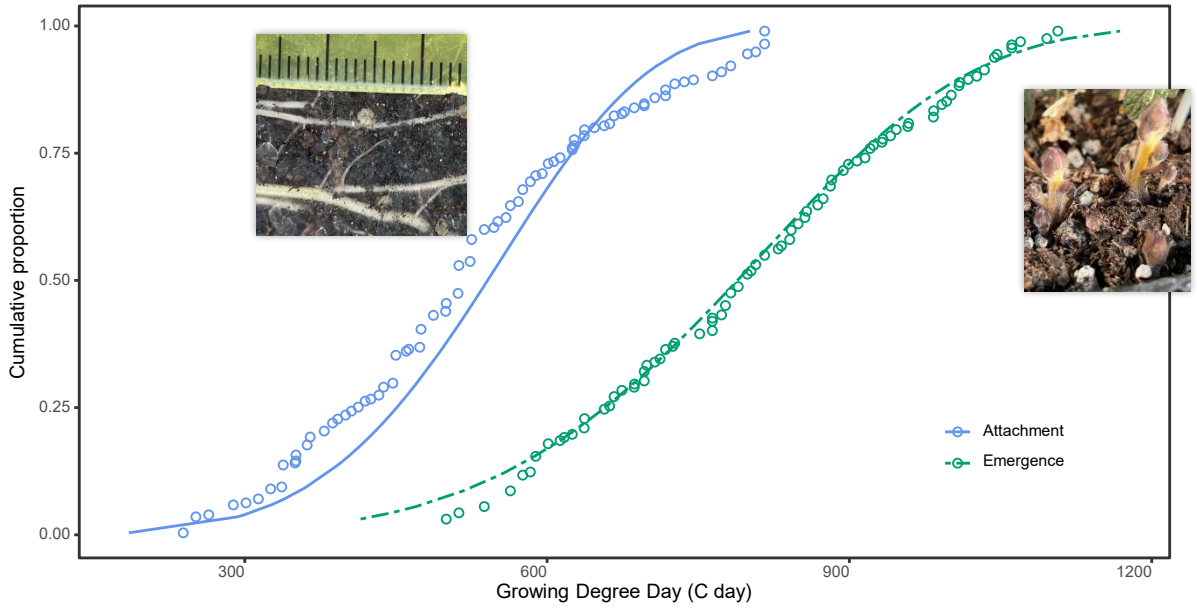
Rimsulfuron efficacy at different broomrape stages



Hosseini and Hanson

Phenological modeling



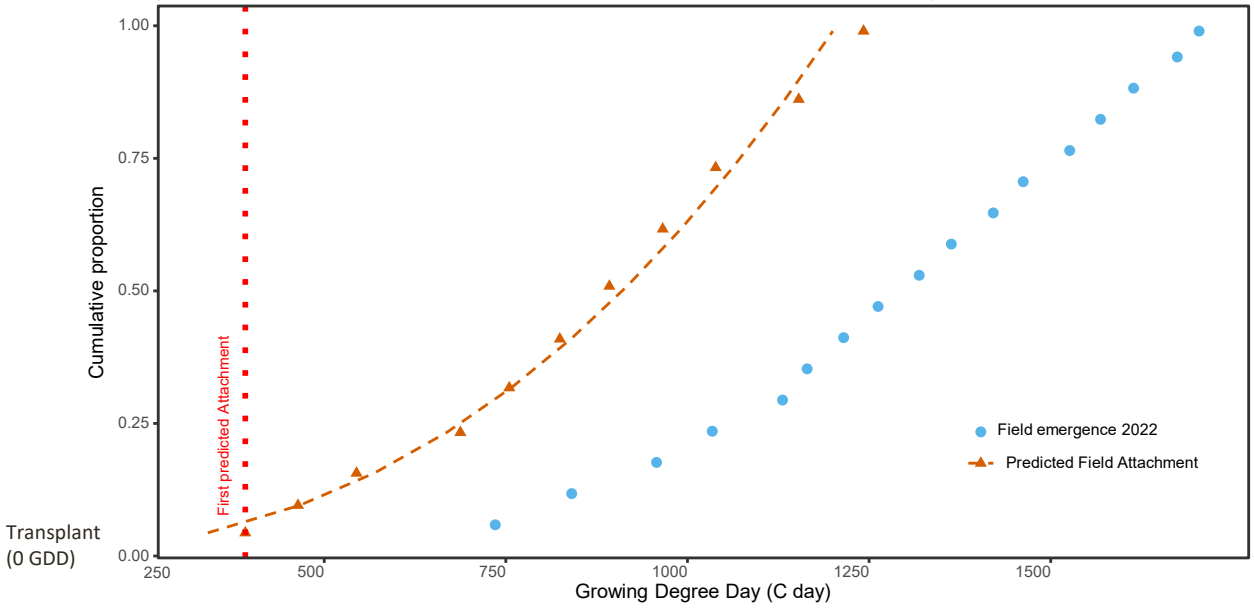


Branched broomrape attachment and emergence stages in a greenhouse experiment (data from 2021-22).

Hosseini

GH modeling to aid field predictions

Branched broomrape emergence in field (data from 2022)
and predicted attachments (calculated based on GH relationship).



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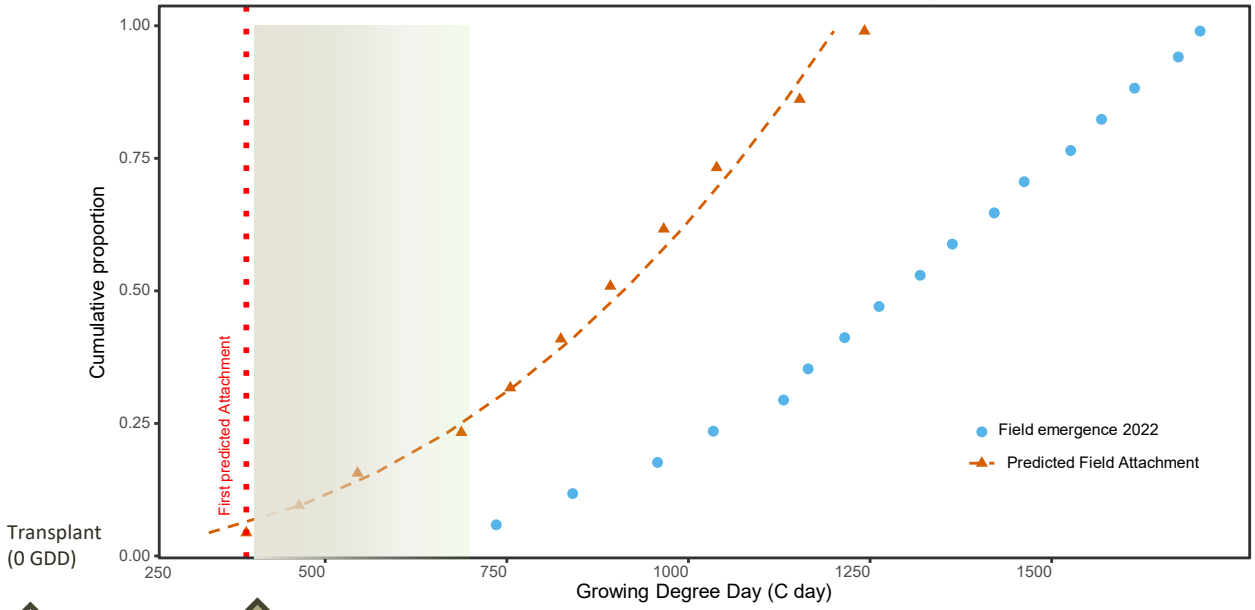

Transplant
(0 GDD)

Chemigated Matrix

GH modeling to aid field predictions

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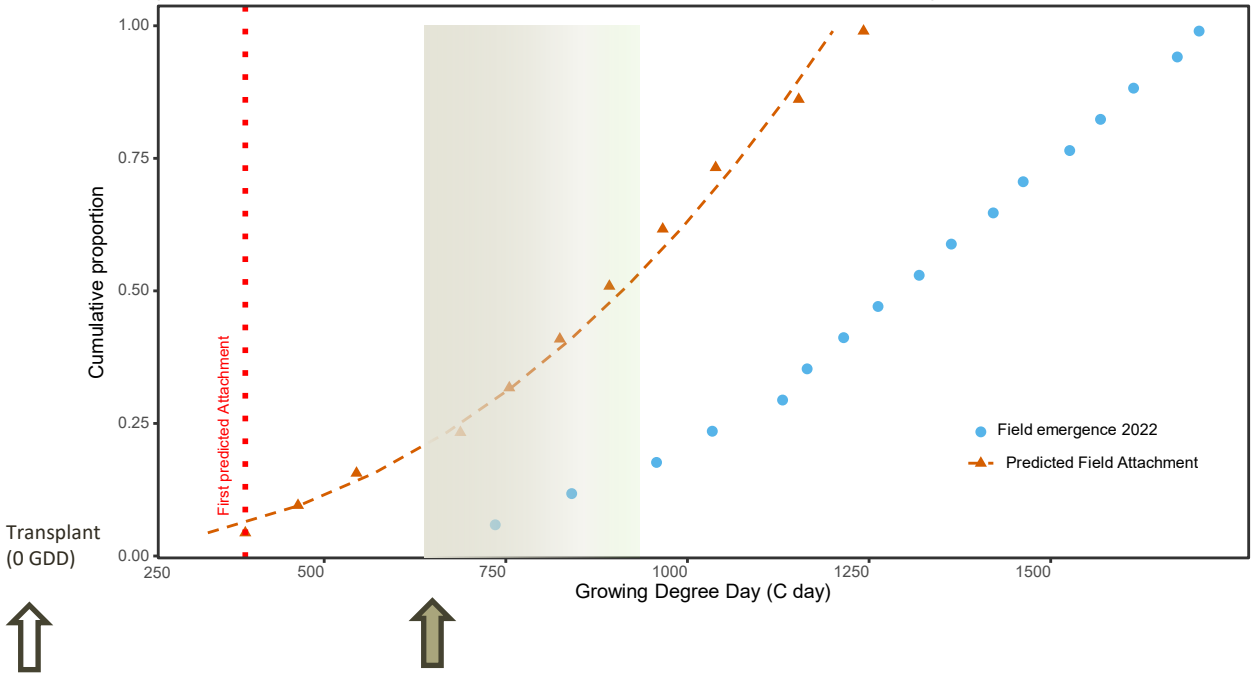

Chemigated Matrix

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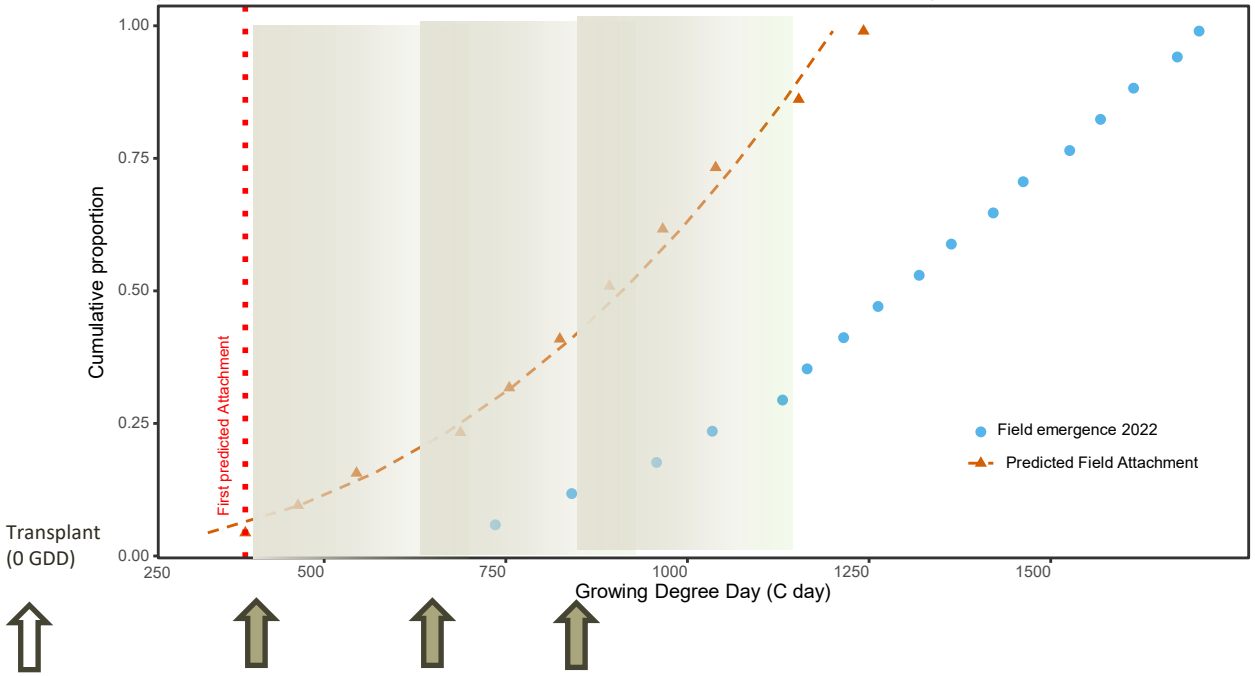
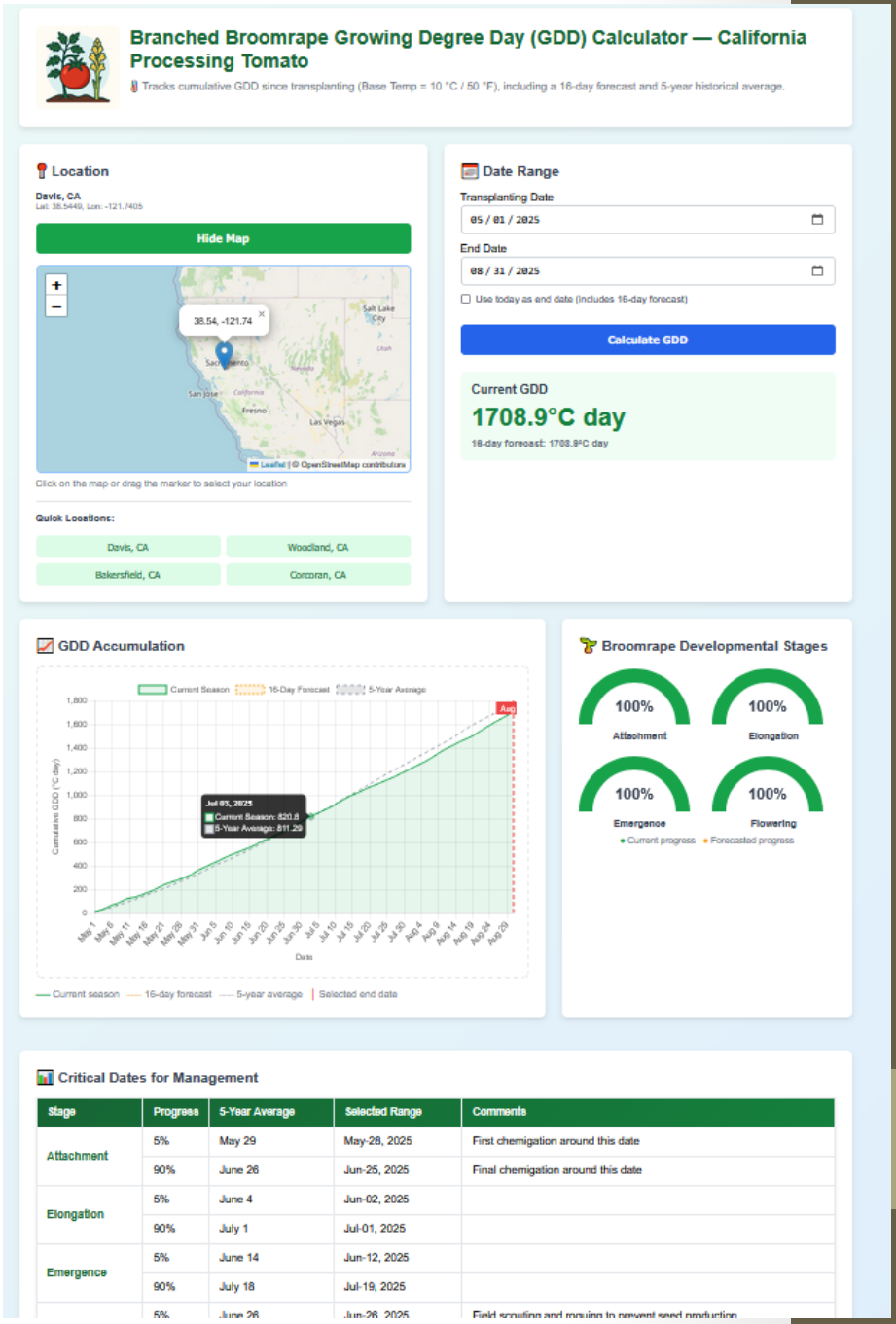


Chemigated Matrix

- Mesgaran team developed 1st pass GDD calculator tool based on earlier GH work. Will validate during 2026

Site still in development, will be on UC broomrape website by spring

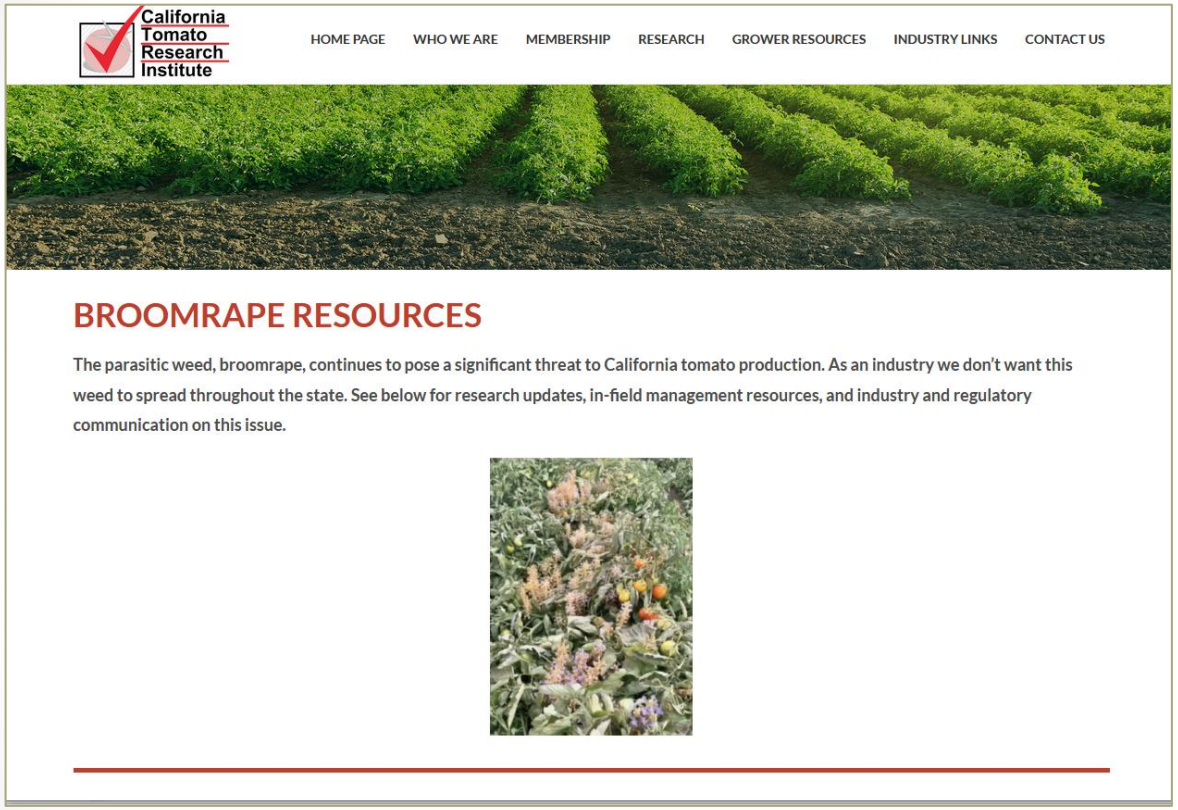


Recommendations

- Follow Compliance Agreement recommendations
  - Guidelines for producing tomatoes under broomrape risk. Allows harvest while reducing risk to the industry

- 1. Know what BR is and train field staff to ID and report
- 2. Take steps to clean equipment between fields to reduce spreading seed to new sites/regions
- 3. Consider the Matrix chemigation protocol at recommended rates and timings. Risk reduction and/or management
- 4. Plant known-infested or high risk fields as late as feasible within your planting window
- 5. Scout and rogue fields to remove broomrape plants by early-flowering stage to reduce seed production. Remove broomrape debris from field and dispose in landfill (do not compost)

Industry coordinated outreach



Industry coordination and engagement via California Tomato Research Institute

Branched Broomrape in California

Phelipanche ramosa

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Branched broomrape (*Phelipanche ramosa*) is a parasitic plant that attacks a broad range of high-value broadleaf crops — including tomato, cabbage, potato, eggplant, carrot, pepper, beans, celery, peanut and sunflower. Its recent re-emergence in Central Valley

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Branched Broomrape Control

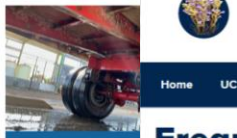
Home › Branched Broomrape Control

Risk of Broomrape Introduction

Field Scouting

The CDFA Broomrape board https://www.cdfa.ca.gov/plant/ipc/broomrape/ was convened in 2024 to begin recommending actions to the Secretary of Agriculture to reduce the risk of further spread of branched broomrape in the state while protecting important agricultural industries. The board had extensive consultations with growers, researchers, and regulators developed a strategic plan to guide board activities and started developing programs and protocols that would allow production of host crop such as processing tomatoes while minimizing the threat of branched broomrape. The

Field Management



Equipment Sanitation

Branched Broomrape in California

Phelipanche ramosa

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Frequently Asked Questions

Home › Frequently Asked Questions

This FAQ complements the voluntary compliance agreement framework developed by the CDFA Broomrape Board. UC researchers will continue to update these rec based on new findings and industry feedback. For questions or to request a field visit, contact your local farm advisor or the UC Broomrape research team.

Expand A

- Q: What is branched broomrape?
- Q: What crops and weeds are affected by broomrape in California?
- Q: When do you expect to see broomrape plants in tomatoes in California?
- Q: Why should I care about broomrape?
- Q: How should I scout for broomrape?
- Q: Should my level of concern change depending on where I farm?
- Q: What makes a field "high-risk"?

Acknowledgements:
- Hanson lab group, Swett lab group
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- Patricia Lazicki, Gene Miyao, Coby Goldwasser

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